May 25, 1943. C. J. FREY 2,320,227

SORTING APPARATUS

Filed June 26, 1941 2 Sheets-Sheet 1

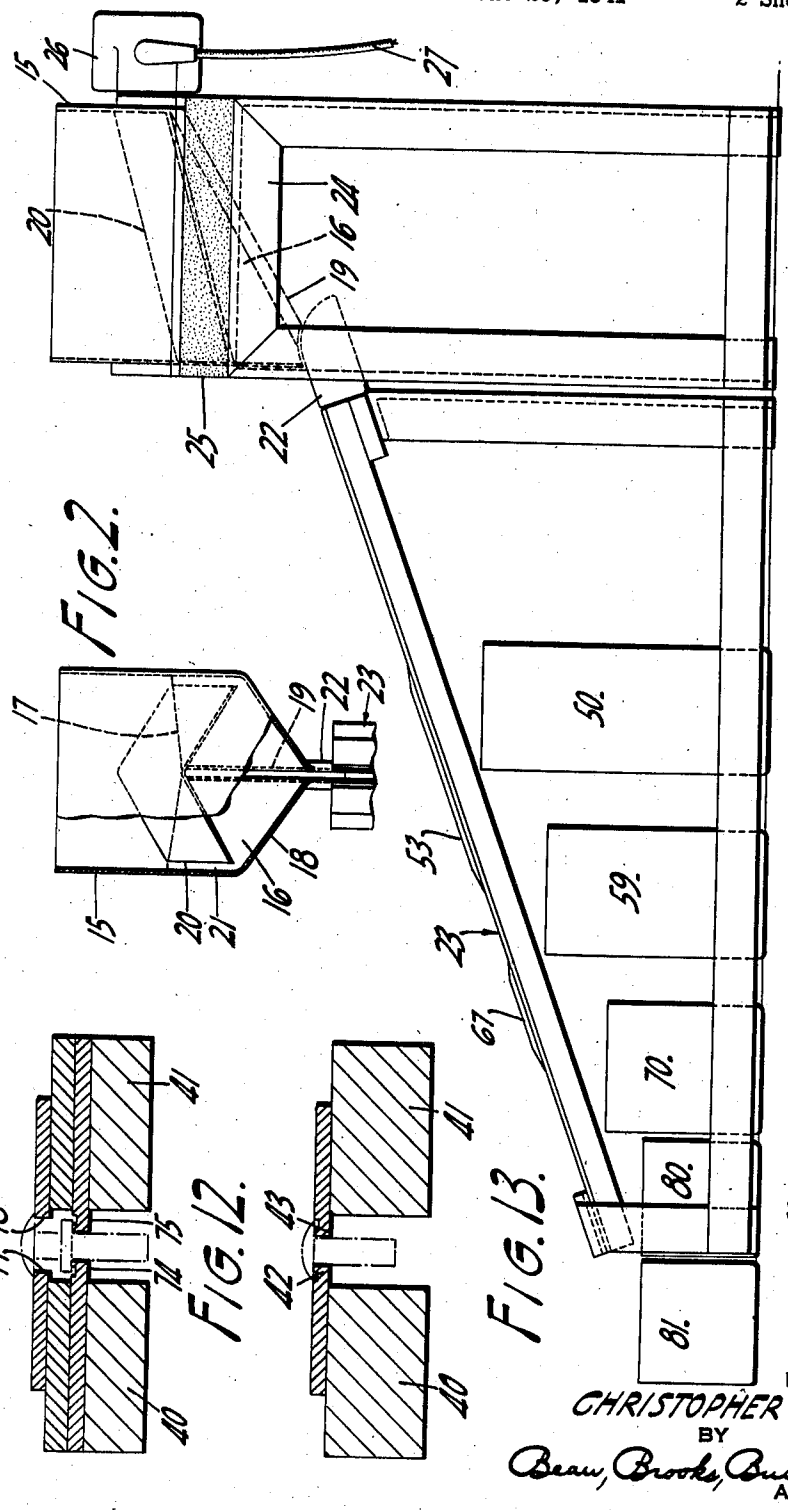


FIG. 1.

FIG. 2.

FIG. 12.

FIG. 13.

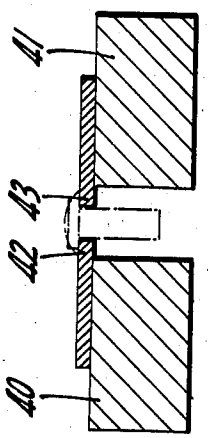


FIG. 11.

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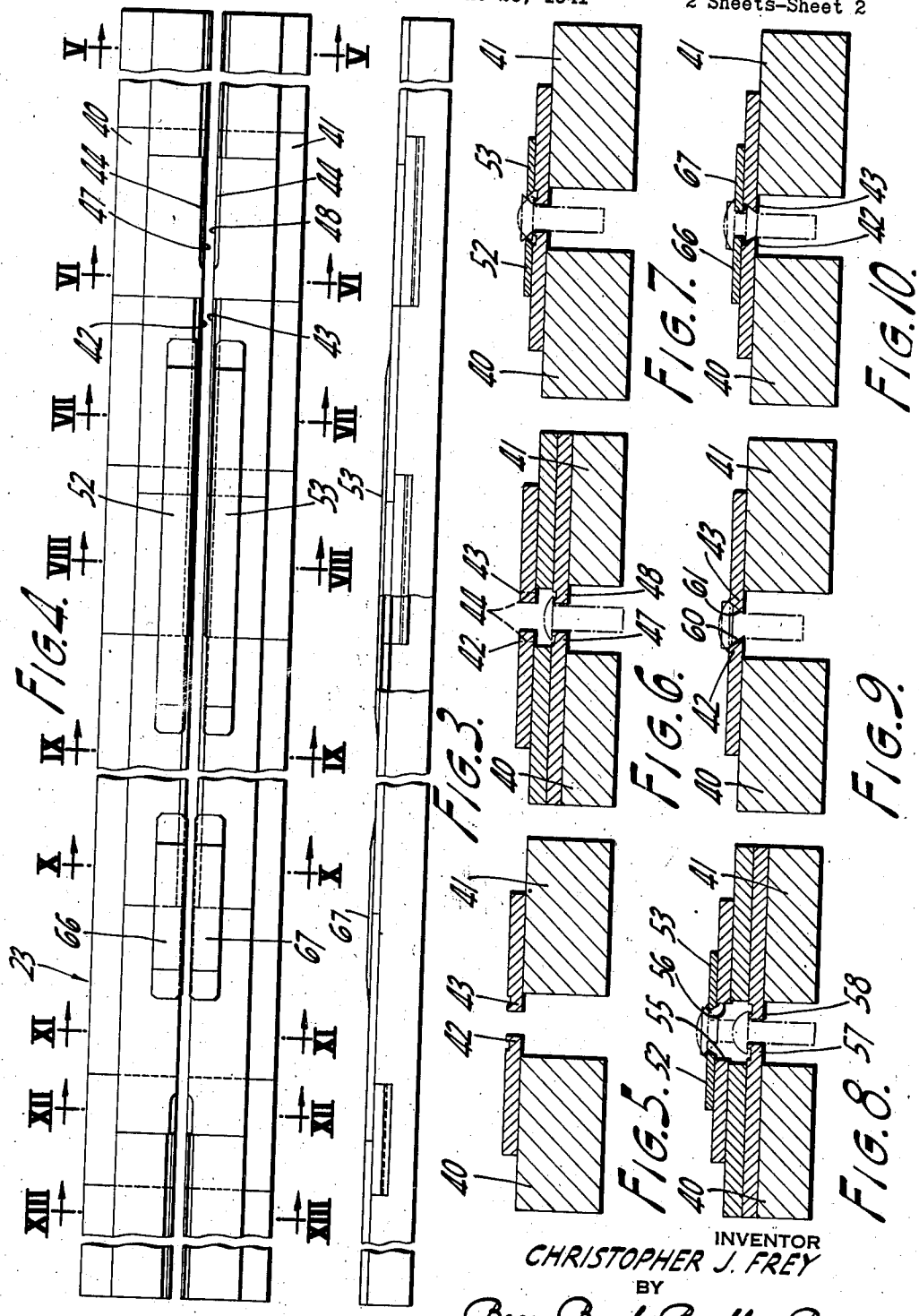


FIG. 4.

FIG. 7.

FIG. 10.

FIG. 3.

FIG. 6.

FIG. 9.

FIG. 5.

FIG. 8.

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2,320,227

SORTING APPARATUS

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Application June 26, 1941, Serial No. 399,930

10 Claims. (Cl. 209—99)

This invention relates to means for separating solid articles and particularly to apparatus for assorting and segregating rivets, or other headed fasteners, or articles of analogous shape.

The apparatus of the instant invention has particular application in the assortment and segregation of rivets, screws, or the like, having generally the same shank diameter but various forms of heads. In instances where a bulk quantity of rivets, or the like, of different diameters are encountered, other means may be utilized prior to use of my present apparatus for assorting and segregating the rivets into groups of like shank diameter.

A specific embodiment of apparatus employing the principles of my invention is shown in the accompanying drawings and described in detail in the ensuing specification. However, it is to be understood that the described embodiment is merely by way of example and that I do not consider my invention limited otherwise than as defined in the appended claims.

In the drawings

Fig. 1 is a general side elevational view of a preferred form of my apparatus;

Fig. 2 is a fragmentary elevational view of the hopper portion of the apparatus, viewed from the left as seen in Fig. 1, and with parts thereof broken away for added clearness;

Fig. 3 is a fragmentary elevational view on a somewhat enlarged scale of the inclined trackway portion of the apparatus of Fig. 1;

Fig. 4 is a fragmentary top plan view of the element of Fig. 2;

Fig. 5 is a transverse cross-sectional view taken on the line V—V of Fig. 4;

Fig. 6 is a transverse cross-sectional view taken on the line VI—VI of Fig. 4;

Fig. 7 is a transverse cross-sectional view taken on the line VII—VII of Fig. 4;

Fig. 8 is a transverse cross-sectional view taken on the line VIII—VIII of Fig. 4;

Fig. 9 is a transverse cross-sectional view taken on the line IX—IX of Fig. 4;

Fig. 10 is a transverse cross-sectional view taken on the line X—X of Fig. 4;

Fig. 11 is a transverse cross-sectional view taken on the line XI—XI of Fig. 4;

Fig. 12 is a transverse cross-sectional view taken on the line XII—XII of Fig. 4; and

Fig. 13 is a transverse cross-sectional view taken on the line XIII—XIII of Fig. 4.

In the drawings like characters of reference denote like parts throughout the specification and the numeral 15 designates a container or a hopper into which a mixed charge of rivets or other analogous articles to be sorted are placed. It will be noted that this hopper has a bottom wall 16 which inclines downwardly to the left as viewed in Fig. 1.

While it does not form a part of the present invention and therefore is not shown in great detail, it is also noted here that the bottom wall 16 is substantially flat at its upper right hand end as viewed in Fig. 1, as at 17, Fig. 2, but tapers gradually so that its transverse cross-section at the left hand or lower end, as viewed in Fig. 1, is substantially V-shaped, see 18 in Fig. 2. The apex of the V is provided with a longitudinal groove at the edges of which there are provided a pair of spaced depending flanges 19 which are so spaced as to provide a channel for receiving the shank portions of rivets of proper size.

To avoid jamming of the contents of the hopper in their course to the bottom of the V-shaped bottom wall, a baffle plate 20 of inverted V-shape is disposed in the hopper and extends across the major portion thereof to leave only shallow longitudinal slots 21 between its opposite edges and the interior longitudinal walls of the hopper 15.

To the lower left-hand end of the hopper 15 there is joined a member 22 which serves merely as an extension of the channel track formed by the spaced flanges 19 of the lower wall of the hopper 15 and is provided to connect between such flanges and the rivet assorting and segregating means proper, which is designated generally 23.

In Fig. 1 the numeral 24 designates an elevated supporting platform for the hopper 15 and it will be noted that the hopper 15 is resiliently mounted on such support as by means of a rubber cushion 25, or the like. In Fig. 1 the numeral 26 designates a vibrator for the hopper which is secured thereagainst and may be of any desired form. Generally speaking such vibrating or agitating means will incorporate an electric driving motor and a suitable electrical conductor therefor is designated 27 in Fig. 1.

The assorting and segregating means designated 23 comprises essentially an inclined trackway for guiding rivets, or like parts to be assorted, therealong from the hopper to various points of discharge from the assorting means. While the means 23 is shown in the drawings and described in the following detailed description as comprising an assembly of a variety of constituent plates and bars, such construction is merely for facility in fabrication. Once assembled

and in use the means 23 comprises a rigid whole with no parts thereof movable relative to other parts. The only movement is the relatively small amplitude vibration which is imparted to the inclined trackway by reason of its connection with the vibrating hopper 15. However, it is to be understood that it is not necessary that the trackway be vibrated in all instances. For this reason I shall describe the trackway of my invention with emphasis on its functional characteristics of shape rather than on the number, size and extent of the various pieces of metal which are rigidly secured to each other to form the trackway.

The means 23 comprising the inclined trackway consists of a pair of spaced rails 40 and 41. In the illustrated form, the rails 40 and 41 are identical to each other but of opposite hand. Rails 40 and 41 extend in spaced parallel relation and each has an upper ledge, 42 and 43 respectively, directed toward the other to provide a restricted slot. The slot formed by the upper extensions 42 and 43 extends substantially the entire length of the trackway means 23 and is modified only by the presence of several enlargements in width thereof. Its primary width, that is, its width throughout the major portion of the length of the apparatus, is only sufficiently wider than the diameters of the shanks of articles to be sorted to provide free sliding clearance.

Beginning with the right-hand end of the trackway, as seen in Figs. 1, 3 and 4, a row of aligned rivets is introduced to the slot formed by the extensions 42 and 43, Fig. 5. The heads of the rivets so introduced will be of various size and shape but the shank diameters of the fasteners will all be substantially the same.

In the embodiment illustrated in the drawings and described herein by way of example, it is contemplated that the mixtures of rivets to be assorted and segregated will comprise five different head styles with substantially the same shank diameters. The length of the various rivets handled by the device is immaterial. The five head styles dealt with in the exemplary embodiment and the order in which they are separated from the bulk mixture in passing through the device are first, special brazier heads; two, round heads; three, countersunk heads; four, flat heads; and five, regular brazier heads. The brazier heads are relatively flat, oval headed rivets and the special brazier head is distinguished from the regular brazier head in that it is relatively smaller in head diameter than the latter.

The rivets first separated are the special brazier heads and separation of this class of rivets is effected by virtue of the fact that the special brazier heads are smaller in diameter than any of the other four classes of heads encountered in the mixture. Between the points where the transverse cross-sections on the lines V—V and VI—VI are taken, the ledges 42 and 43 are cut back, as at 44, to provide a slot therebetween of enlarged width.

The width of this enlarged slot is just sufficient to permit the special brazier heads to fall through, all of the remaining rivets of the mixture passing over such enlargement because their head diameters are greater than the slot enlargement at 44. To preserve accurate alignment of the remaining four classes of rivets at this point, the rails 40 and 41 have lower inwardly directed ledges 47 and 48, respectively, and a longitudinal channel is thus formed in the opposed face of each rail 40 and 41 to permit movement of the special brazier heads therealong.

Just after the special brazier heads pass the transverse plane of section VI—VI and after the upper slot has resumed its normal width, just larger than the shank diameter of the rivets, the ledges 47 and 48 terminate and thus permit the special brazier head rivets to fall clear of the apparatus and a suitable receptacle may be provided for receiving this class of rivets as at 50 in Fig. 1.

The second class of rivets to be separated from the mixture is that class having round heads and, in effecting this separation, advantage is taken of the fact that the diameters of the heads of rivets of this class reduce sharply above the base thereof. As appears from a consideration of Figs. 1 and 7, the rails 40 and 41 are provided with cam rises 52 and 53, respectively. These cam rises have their facing edges shaped to cooperate with the ledges 42 and 43 to form V-shaped grooves so arranged as to receive the round head rivets only. The heads of the remaining three classes of rivets ride up on the rises 52 and 53 while the round head rivets pass therebeneath.

After the remaining three classes of rivets have ridden onto the cam rises 52 and 53, the extensions 42 and 43 are again cut back, as at 55 and 56, to permit the round head rivets beneath the cam rises 52 and 53 to fall to a position where they rest upon inward extensions 57 and 58 formed on the rails 40 and 41, Fig. 8, as in the case of the inward extensions 47 and 48.

After a preliminary separation of the round head rivets in this manner has been effected and at a point where all of the remaining rivets are again safely supported and accurately retained in alignment by the resumption of narrow width of the slot formed by the extensions 42 and 43, the ledges 57 and 58 terminate and the round head rivets are thus permitted to fall free of the device into a container designated 59 in Fig. 1.

After the three remaining classes of rivets have ridden down off the cam rises 52 and 53, they encounter beveled edges 60 and 61 formed on the ledges 42 and 43, which beveled edges permit countersunk heads to drop therebetween to the position indicated in dot and dash lines in Fig. 9. The remaining two classes of rivets cannot fall into the flaring slot by reason of the size of their heads and the lower edges of the beveled faces 60 and 61 maintain accurate alignment of the remaining rivets.

From this point the rivets move along the trackway and the remaining two classes of rivets ride up on a second pair of cam rises 66 and 67. The spacing of the opposed faces of the cam rises 66 and 67 is such as to accurately guide the shanks of the two remaining classes of rivets in an aligned row, see Fig. 10, and after these two remaining classes of rivets are safely on the cam rises 66 and 67, the ledges 42 and 43 are again cut back to permit the countersunk head rivets supported thereby to drop clear of the apparatus into a container 70. It will be noted that in this instance there is no need for the secondary lower ledge of the preceding stages.

The final separation of the flat head rivets from the regular brazier head rivets is effected by virtue of the smaller diameter of the former. As shown in Fig. 12 the rails 40 and 41 are provided with inwardly directed ledges 74 and 75 for accurately guiding the shanks of the two classes of rivets and the ledges 42 and 43 are again cut back, as at 77 and 78, an amount sufficient to permit the flat head rivets to fall down

to the ledges 74 and 75, such falling again being arranged to occur with all of the rivet shanks guided accurately in a lateral direction.

After the slot formed by the ledges 42 and 43 has resumed its normal narrow shank guiding width, as in Fig. 13, the ledges 74 and 75 terminate, permitting the flat head rivets to drop into a container 80. The remaining regular brazier head rivets continue along the ledges 42 and 43 to the end of the trackway and are discharged into a container 81.

The degree of inclination of the trackway 23 and the violence of vibration of the apparatus will obviously by regulated to produce a continuous sliding movement of rivets along the trackway under the force of gravity, impeded to the desired extent by the force of friction; and in some cases it will be found unnecessary to transmit vibration to the trackway, and the headed elements will move along the trackway with a smooth sliding motion.

What is claimed is:

1. Assorting and segregating apparatus for headed elements comprising similar shanks and enlarged head portions of varying size, said apparatus comprising an inclined track having a pair of elongate spaced parallel supporting means providing a slot extending substantially the length of said track only slightly wider than the shanks of said elements, means for introducing an aligned row of said elements to the upper end of said track with their shank portions depending in said slot and their head portions resting on said supporting means, said slot being enlarged at its upper portion whereby heads smaller than said enlargement may drop downward therein when they come into registry with said enlargement in movement along said slot without discharging through said slot and whereby the shank of elements having heads larger than said enlargement are guided in the lower unenlarged portion of said slot, there being channels formed in the opposed faces of said means for receiving the heads of dropped elements and permitting movement of said elements therealong beyond said enlargement, and the lower portion of said slot being formed with an enlargement at the terminus of said channels to permit the final dropping of said lowered elements from said apparatus at a point spaced along said rails from said first mentioned upper enlargement of the slot.

2. Assorting and segregating apparatus for headed elements comprising similar shanks and enlarged head portions of varying size, said apparatus comprising an inclined track having a pair of elongate spaced parallel supporting means providing a slot extending substantially the length of said track only slightly wider than the shanks of said elements, means for introducing an alinged row of said elements to the upper end of said track with their shank portions depending in said slot and their head portions resting on said supporting means, a plurality of successively occurring ejecting stations along said track, the upper portion of said slot being enlarged at each of said stations whereby heads smaller than said enlargement may drop downward therein when they come into registry with said enlargement in movement along said slot without discharging through said slot and whereby the shanks of elements having heads larger than said enlargement are guided in the lower unenlarged portion of said slot, there being channels formed in the opposed faces of said means for receiving the heads of dropped elements and permitting movement of said elements therealong beyond said enlargement, and the lower portion of said slot being formed with an enlargement at the terminus of said channels to permit the final dropping of said lowered elements from said apparatus at a point spaced along said rails from said first mentioned upper enlargement of the slot.

3. Assorting and segregating apparatus for headed elements comprising similar shanks and enlarged head portions of varying size, said apparatus comprising an inclined track having a pair of elongate spaced parallel supporting means providing a slot extending substantially the length of said track only slightly wider than the shanks of said elements, means for introducing an aligned row of said elements to the upper end of said track with their shank portions depending in said slot and their head portions resting on said supporting means, said slot being enlarged at its upper portion whereby heads smaller than said enlargement may drop downward therein when they come into registry with said enlargement in movement along said slot without discharging through said slot and whereby the shanks of elements having heads larger than said enlargement are guided in the lower unenlarged portion of said slot, there being channels formed in the opposed faces of said means for receiving the heads of dropped elements and permitting movement of said elements therealong beyond said enlargement, the lower portion of said slot being formed with an enlargement at the terminus of said channels to permit the final dropping of said lowered elements from said apparatus at a point spaced along said rails from said first mentioned upper enlargement of the slot, and means for continuously vibrating said track to cause said headed elements to move downwardly therealong in said slot.

4. Assorting and segregating apparatus for headed elements comprising similar shanks and enlarged head portions of varying size, said apparatus comprising an inclined track having a pair of elongate spaced parallel supporting means providing a slot extending substantially the length of said track only slightly wider than the shanks of said elements, means for introducing an aligned row of said elements to the upper end of said track with their shank portions depending in said slot and their head portions resting on said supporting means, a plurality of successively occurring ejecting stations along said track, said slot being enlarged at its upper portion at each of said stations whereby heads smaller than said enlargement may drop downward therein when they come into registry with said enlargement in movement along said slot without discharging through said slot and whereby the shanks of elements having heads larger than said enlargement are guided in the lower unenlarged portion of said slot, there being channels formed in the opposed faces of said means for receiving the heads of dropped elements and permitting movement of said elements therealong beyond said enlargement, the lower portion of said slot being formed with an enlargement at the terminus of said channels to permit the final dropping of said lowered elements from said apparatus at a point spaced along said rails from said first mentioned upper enlargement of the slot, and means for continuously vibrating said track to cause said

headed elements to move downwardly therealong in said slot.

5. Assorting and segregating apparatus for headed elements comprising similar shanks and enlarged head portions of varying size, said apparatus comprising means having an elongate slot only slightly wider than the shanks of said elements, means for introducing an aligned row of said elements to said slot with their shank portions depending in said slot and their head portions resting on said means adjacent to said slot at opposite sides thereof for movement therealong, said slot being enlarged at its upper portion whereby heads smaller than said enlargement may drop downward therein when they come into registry with said enlargement in movement along said slot without discharging through said slot and whereby the shanks of elements having heads larger than said enlargement are guided in the lower unenlarged portion of said slot, there being channels formed in the opposed walls of said slot for receiving the heads of dropped elements and permitting movement of said elements therealong beyond said enlargement, and the lower portion of said slot being formed with an enlargement at the terminus of said channels to permit the final dropping of said lowered elements from said apparatus at a point spaced along said means from said first mentioned upper enlargement of the slot.

6. Assorting and segregating apparatus for headed elements comprising similar shanks and enlarged head portions of varying size, said apparatus comprising an inclined track having a pair of elongate spaced parallel supporting means providing a slot extending substantially the length of said track only slightly wider than the shanks of said elements, means for introducing an aligned row of said elements to the upper end of said track with their shank portions depending in said slot and their head portions resting on said supporting means, a pair of cam rises formed on said track and spaced from each other a distance greater than the width of said slot whereby the heads of some of the headed elements will pass between said cam rises and other larger heads will ride up on the cam rises, and an enlargement in said slot beneath said cam rises whereby headed elements passing beneath the cam rises may fall from said apparatus while the shanks of the remaining headed elements are continuously maintained in accurately aligned relation by lateral guiding of said cam means.

7. Assorting and segregating apparatus for headed elements comprising similar shanks and enlarged head portions of varying size, said apparatus comprising an inclined track having a pair of elongate spaced parallel supporting means providing a slot extending substantially the length of said track only slightly wider than the shanks of said elements, means for introducing an aligned row of said elements to the upper end of said track with their shank portions depending in said slot and their head portions resting on said supporting means, a pair of cam rises formed on said track and spaced from each other a distance greater than the width of said slot whereby the heads of some of the headed elements will pass between said cam rises and other larger heads will ride up on the cam rises, an enlargement in said slot beneath said cam rises whereby headed elements passing beneath the cam rises may fall from said apparatus while the shanks of the remaining headed elements are continuously maintained in accurately aligned relation by lateral guiding of said cam means, and means for vibrating said track to cause a row of said elements to move progressively downwardly therealong.

8. Assorting and segregating apparatus for headed elements comprising similar shanks and enlarged head portions of varying size, said apparatus comprising an inclined track having a pair of elongate spaced parallel supporting means providing a slot extending substantially the length of said track only slightly wider than the shanks of said elements, means for introducing an aligned row of said elements to the upper end of said track with their shank portions depending in said slot and their head portions resting on said supporting means, a pair of cam rises formed on said track and spaced from each other a distance greater than the width of said slot whereby the heads of some of the headed elements will pass between said cam rises and other larger heads will ride up on the cam rises, said slot being enlarged at its upper portion beneath said cam rises whereby headed elements passing beneath the cam rises may drop downward therein when they come into registry with said enlargement in movement along said slot without discharging through said slot and whereby the shanks of elements riding upon said cam are guided in the lower unenlarged portion of said slot, there being channels formed in the opposed walls of said slot for receiving the heads of dropped elements and permitting movement of said elements therealong beyond said enlargement and the lower portion of said slot being formed with an enlargement at the terminus of said channels to permit final dropping of said lowered elements from said apparatus at a point spaced along said rails from said first mentioned upper enlargement of said slot.

9. Assorting and segregating apparatus for headed elements comprising similar shanks and enlarged head portions of varying size, said apparatus comprising an inclined track having a pair of elongate spaced parallel supporting means providing a slot extending substantially the length of said track only slightly wider than the shanks of said elements, means for introducing an aligned row of said elements to the upper end of said track with their shank portions depending in said slot and their head portions resting on said supporting means, said slot being enlarged at its upper portion whereby heads smaller than said enlargement may drop downward therein when they come into register with said enlargement in movement along said slot without discharging through said slot, the depth of said enlargement being small enough to permit the shanks of elements having heads larger than said enlargement to remain guided in the lower unenlarged portion of said slot, there being channels formed in the opposed faces of said means for receiving the heads of dropped elements and permitting movement of said elements therealong beyond said enlargement, and the lower portion of said slot being formed with an enlargement at the terminus of said channels to permit the final dropping of said lowered elements from said apparatus at a point spaced along said rails from said first mentioned upper enlargement of the slot.

10. Assorting and segregating apparatus for headed elements including opposed track means spaced to provide a slot therebetween, said track

means being adapted to slidably engage said headed elements under the heated portions thereof and to vertically support said elements with the head-dependent portions thereof extending through said slot, said slot being variously dimensioned in width along said track means for permitting headed elements having differently dimensioned heads to slide along said track means and to fall through said slot at different positions along said track means for segregation of said elements according to the dimensions of their heads, said track means having a plurality of superposed portions for vertically stepped support of differently dimensioned headed elements, said superposed portions being vertically spaced so as to cooperate to maintain the head-dependent portions of said elements against lateral movement during passage through said slot.

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